

## **Modeling and Analysis of Chill and Fill Processes for the EDU Tank**

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NASA's future missions may require long-term storage and transfer of cryogenic propellants. The Engineering Development Unit (EDU), a NASA in-house effort supported by both Marshall Space Flight Center (MSFC) and Glenn Research Center (GRC), is a Cryogenic Fluid Management (CFM) test article that primarily serves as a manufacturing pathfinder and a risk reduction task for a future CFM payload. The EDU test article, comprises a flight like tank, internal components, insulation, and attachment struts. The EDU is designed to perform integrated passive thermal control performance testing with liquid hydrogen in a space-like vacuum environment. A series of tests, with liquid hydrogen as a testing fluid, was conducted at Test Stand 300 at MSFC during summer of 2014. The objective of this effort was to develop a thermal/fluid model for evaluating the thermodynamic behavior of the EDU tank during the chill and fill processes. Generalized Fluid System Simulation Program (GFSSP), an MSFC in-house general-purpose computer program for flow network analysis, was utilized to model and simulate the chill and fill portion of the testing. The model contained the liquid hydrogen supply source, feed system, EDU tank, and vent system. The modeling description and comparison of model predictions with the test data will be presented in the final paper.